

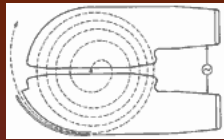
The background of the slide is a dark blue gradient. In the center, there is a large, circular, stylized graphic that resembles a clock face or a complex network diagram. This graphic has a dark outer ring, a lighter inner ring, and a central area with a grid-like pattern. Radiating from this central circle are several lines of different colors (red, yellow, green, blue) that extend towards the edges of the slide. The text is overlaid on this graphic.

# Standards and Competency

Safety Systems

USPAS

June 2004



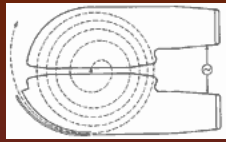
# Outline



- ❖ Standards and Competency

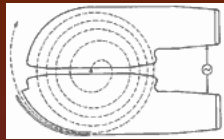
- ❖ Objective

- ❖ Communicate the requirements for technical competency in safety system management and engineering.



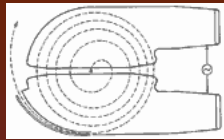
# In a nutshell...

- ❖ Accelerators have hazards that are potentially lethal to people and harmful to unique, expensive equipment as well as the environment
- ❖ Management assumes the responsibility for safe and productive accelerator operations – this is a public trust
- ❖ By proxy, the public relies on competent personnel to evaluate, quantify, and manage risk
  - ❖ Failure to meet this trust can result in harsh consequences
    - ❖ Human Loss
    - ❖ Financial Loss
    - ❖ Valuable Scientific Research Loss
    - ❖ In worst cases – criminal or civil prosecution
- ❖ Standards attempt to capture recognized accepted good practice.
- ❖ To be competent, one must have a proven understanding of the standards and the implications of decisions that affect safety.



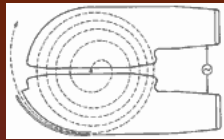
# Four Approaches to Safety Systems

- ❖ System Safety (882/FAA/NASA)
- ❖ IEC and SILs
- ❖ Machine Safety
- ❖ Nuclear/Radiation Safety



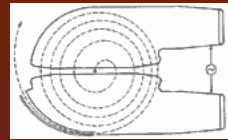
# Types of Standards

- ❖ Consensus Standards
- ❖ Performance Based Standards
- ❖ Proscriptive Standards
  
- ❖ Normative Information (Shall, Must, Comply...)
- ❖ Informative Information (Guidance, Reports,...)



# Competency Requirements

- ❖ Applicable education and training
- ❖ Demonstrated ability to apply education and training
  - ❖ Peer Recommendation
  - ❖ Successfully pass examination(s)
  - ❖ Ability to determine appropriate techniques
- ❖ Continuing education and professional growth
  - ❖ “Maintenance” points



# IEC61508

## **Functional safety of electrical/electronic/programmable electronic safety related systems –**

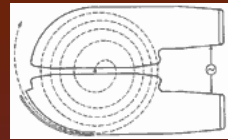
### Management Responsibilities

Managers shall...specify all management and technical activities that are necessary to ensure that the E/E/PE safety-related systems achieve and maintain the required functional safety. In particular, the following should be considered:

6.2.1 h) the procedures for ensuring that applicable parties involved in any of the overall, E/E/PES or software safety lifecycle activities are competent to carry out the activities for which they are accountable; in particular, the following should be specified:

- the training of staff in diagnosing and repairing faults and in system testing;
- the training of operations staff;
- the retraining of staff at periodic intervals;

# Examples from IEC61508

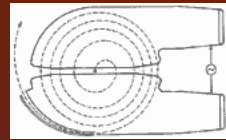


The following factors should be considered when assessing the competence of persons to carry out their duties:

- a) engineering knowledge appropriate to the application area;
- b) engineering knowledge appropriate to the technology (for example electrical, electronic, programmable electronic, software engineering);
- c) safety engineering knowledge appropriate to the technology;
- d) knowledge of the legal and safety regulatory framework;
- e) the consequences in the event of failure of the E/E/PE safety-related systems; the greater the consequences, the more rigorous should be the specification and assessment of competence;
- f) the safety integrity levels of the E/E/PE safety-related systems; the higher the safety integrity levels, the more rigorous should be the specification and assessment of competence;
- g) the novelty of the design, design procedures or application; the newer or more untried the designs, design procedures or application, the more rigorous the specification and assessment of competence should be;
- h) previous experience and its relevance to the specific duties to be performed and the technology being employed; the greater the required competence levels, the closer the fit should be between the competencies developed from previous experience and those required for the specific duties to be undertaken;
- i) relevance of qualifications to specific duties to be performed.



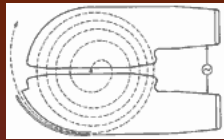
# Examples from IEC61511



**5.2.2.2** Persons, departments or organizations involved in safety life-cycle activities shall be competent to carry out the activities for which they are accountable.

NOTE As a minimum, the following items should be addressed when considering the competence of persons, departments, organizations or other units involved in safety life-cycle activities:

- a) engineering knowledge, training and experience appropriate to the process application;
- b) engineering knowledge, training and experience appropriate to the applicable technology used (for example, electrical, electronic or programmable electronic);
- c) engineering knowledge, training and experience appropriate to the sensors and final elements;
- d) safety engineering knowledge (for example, process safety analysis);
- e) knowledge of the legal and safety regulatory requirements;
- f) adequate management and leadership skills appropriate to their role in safety life-cycle activities;
- g) understanding of the potential consequence of an event;
- h) the safety integrity level of the safety instrumented functions;
- i) the novelty and complexity of the application and the technology.



# Example Certifications

## ◆ BCSP

### ◆ ANSI/ISO 17024 Accredited

(Accredited Personnel Certification Programs)

### ◆ System Safety Specialty Examination (being phased out)

- ◆ For US Navy and other DOD offices as requested

## ◆ Certified Functional Safety Expert (CFSE)

### ◆ Process Industry

### ◆ Safety Hardware Development

### ◆ Safety Software Development

### ◆ Safety of Machinery